

day 31

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$\frac{d}{dx}(fg) = f'g + fg'$$

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$$

$$\frac{d}{dx}(e^{kx}) = k e^{kx}$$

3.6/ Rectilinear Motion

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\frac{d}{dx}(\csc x) = -\csc x \cot x$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

Position function

$s(t)$,
 $x(t)$,
 $y(t)$

at any time t ,
 $s(t)$ tells where I am
along that track

Velocity function $v(t)$

at any time t ,
 $v(t)$ says what the velocity is

Velocity \Rightarrow chg in position
chg in time [average]

\Rightarrow instantaneous velocity - limit

acceleration function $a(t)$

at any time t ,
 $a(t)$ says what accel. is

acceleration \Rightarrow chg in velocity [average]
chg in time

\Rightarrow instantaneous - limit

magnitude of
velocity
is called
speed

$$|v(t)|$$

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$$Pos = -3 ; \text{velocity} = -4 ; \text{acc} = +1$$

$$\frac{d}{dx}(\sin x) = \cos x$$

$$P = -7 ; V = -4 + (+1) = -3 ; A = +1$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$P = -10 ; V = -3 + 1 = -2 ; A = +1$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$P = -12 ; V = -2 + 1 = -1 ; A = +1$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$P = -13 ; V = -1 + 1 = 0 ; A = +1$$

$$\frac{d}{dx}(\csc x) = -\csc x \cot x$$

$$P = -13 ; V = 0 + 1 = 1 ; A = 1$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

$$P = -12 ; V = 1 + 1 = 2 ; A = 1$$

$$P = -10 ; V = -2 + 1 = -3 ; A = 1$$

$$P = -7 ; V = 3 + 1 = 4 ; A = 1$$

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$$\frac{d}{dx}(\sin x) = \cos x$$

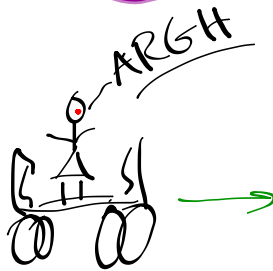
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"Speeding Up" happens when

$$\text{SGN}(v(t)) = \text{SGN}(a(t))$$

SGN is the SIGNUM function

"Slowing Down" happens when
signs of $v(t)$ and $a(t)$ are
DIFFERENT.

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3.6/8) a) avg velocity (think Alg I)

$$\frac{\text{chg in distance}}{\text{chg in time}} = \frac{\text{displacement}}{\text{chg in time}}$$

$$= \frac{600 - 0}{1.5 - 0} = \frac{600}{1.5} = 400 \text{ miles per hr}$$

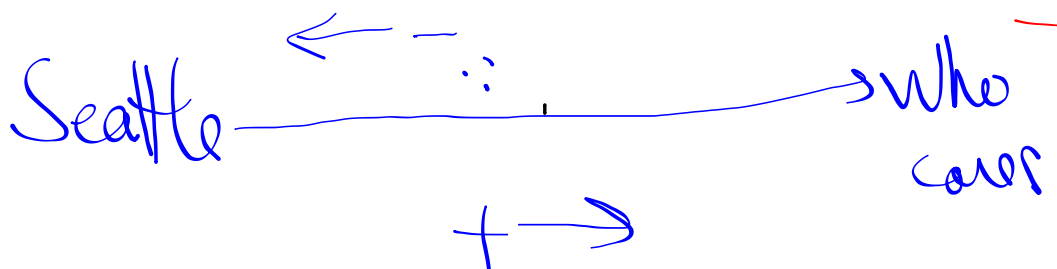
b) 7.5 → 85

avg velocity: $\frac{0 - 375}{85 - 7.5} = \frac{-375}{77.5} = -375 \text{ mpa}$

c) between $t = 3$ and $t = 5$ hrs
(9 am and 11 am)

d) draw in tangent line & find slope.

instantaneous velocity: $\frac{800 - 1600}{7 - 5} = -400 \text{ mph}$



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HW / 3.6
9, 10, 15-18, 22-24

3.7/1-9

VERY IMPORTANT
the big
derivative Rule